Engineering Brief # 22CHG

Date: February 1, 1982

In Reply Refer To: AAS-200

Subject: INFORMATION: Change to Engineering Brief No. 22

From: Chief, Engineering and Specifications Division, AAS-200
To: All Regions

Attn: Chief, Airports Division

We are forwarding a change to Appendix A of Engineering Brief No. 22, Asphalt-Rubber and Rubberized Coal Tar Pitch Emulsion, with changes indicated by asterisks in the margins.

The primary change is to the aggregate gradation in paragraph 2.3.

ORIGINAL SIGNED BY:
EDWARD AIKMAN

Attachment

APPENDIX A

ASPHALT-RUBBER WEARING SURFACE

1. DESCRIPTION

1.1 This item shall consist of a bituminous surface treatment as a wearing course composed of a single or multiple application of asphalt-rubber material and aggregate cover.

2. MATERIALS

2.1 Asphalt-Rubber (Vulcanized). Bitumen shall be asphalt-rubber consisting of a blend of asphalt cement and ground rubber.

a. Asphalt Cement. Asphalt cement shall meet the requirements of ASTM D 3381.

b. Granulated Rubber. Granulated rubber shall meet the following requirements:

Passing sieve	Percent
No. 8	100
No. 50	0-15

The rubber shall have a specific gravity of 1.15 + 0.02 and shall be free of fabric, wire or other contaminating materials, except that up to four percent of calcium carbonate may be included to prevent the particles from sticking together.

2.2 Asphalt-Rubber (Devulcanized). Bitumen shall be asphalt-rubber consisting of a blend of asphalt cement, extender oil, and ground rubber.

a. Asphalt Cement. Asphalt cement shall meet the requirements of ASTM D 3381.

b. Extender Oil. The extender oil shall be a resinous, high flash point aromatic hydrocarbon meeting the following requirements:

Viscosity SSU at 100 degrees F (ASTM D-88) 2500 min.
Flash Point, C.O.C., degrees F (ASTM D-92) 392 min.
Molecular Analysis (AS?M D-2007)
Asphaltenes, Percent by weight 0.1 max.
Aromatics, percent by weight 55 min.

c. Ground Rubber. The ground rubber shall meet the following requirements:

(1). Composition. The rubber shall be a dry, free flowing blend of 40 percent powdered reclaimed (i.e., devulcanized) rubber and 60 percent ground vulcanized rubber scrap selected to have a high material rubber content. It shall be free from fabric, wire or other contaminants except that up to four percent calcium carbonate may be included to prevent the particles from sticking together.

(2). Sieve Analysis

Passing Sieve	Percent
No. 8	100
No. 30	60-80
No. 50	15-40
No. 100	0-15

(3) Mill test. When 40 to 50 grams of rubber retained on the No. 30 sieve are added to a tight set six-inch rubber mill, the material shall band on the mill roll in one pass.

NOTE TO THE ENGINEER: This test is to establish that a sufficient quantity of reclaimed devulcanized rubber is present. END NOTE

Natural rubber shall be a minimum of 30 percent, by weight when tested in accordance with ASTM D-297.

2.3 Aggregate. Aggregate shall consist of a hard, clean aggregate such as crushed rock, crushed gravel, or crushed slag. It shall be of uniform quality throughout and shall be

free from dirt and other deleterious substances. It shall also be essentially dry, with a water content less than 0.5 percent when tested in accordance with ASTM C-70. It shall show no more wear than 10 percent, after 100 revolutions, when tested in accordance with ASTM C 131. At least 75 percent by weight of the material retained on the No. 4 sieve shall have at least one rough angular surface produced by crushing.

* The aggregate shall conform to one of the gradations shown in Table 1.

Table 1 Aggregate Gradation

Sieve Size	% Passing
3/8 in	100
1/4 in	85-100
No. 8	0-5 *

3. COMPOSITION OF ASPHALT-RUBBER BLEND

3.1 Asphalt-Rubber (Vulcanized). The proportions of the asphalt and the granulated rubber, by weight, of the total asphalt-rubber blend shall be 78 percent + 1 percent asphalt and 22 percent + 1 percent granulated rubber.

The materials shall be combined as rapidly as possible for such a time and at such a temperature that the consistency of the mix approaches that of a semi-fluid material. The temperature of the asphalt shall be between 350 degrees F. and 450 degrees F. The necessary reaction time required to achieve this semi-fluid state is a time-temperature relationship. The time may vary from a minimum of 10 minutes
* at 450 degrees F. to as much as one hour at 350 degrees F. The actual reaction time will be determine by laboratory testing. *

* To obtain optimum spraying and wetting viscosity it may be necessary to add a diluent. A high boiling point kerosene may be used in an amount not to exceed 74 percent, by volume, of the hot asphalt-rubber composition. The diluent used shall have a boiling point of not less than 350 degrees F. and the temperature of the asphalt-rubber shall not exceed 350 degrees F. at the time the diluent is added. *

3.2 Asphalt-Rubber (Devulcanized). The asphalt-rubber blend shall be a combination of the asphalt cement, extender oil and ground rubber mixed together at elevated temperatures in accordance with the following proportions and procedures:

(a) Preparation of Asphalt-Extender Oil Mix. The asphalt cement shall be heated to between 250 and 400 degrees F. and combined with from two to six percent of the rubber extender oil to reduce the viscosity of the asphalt cement to within the range of 600 to 1800 poises at 140 degrees F. when tested in accordance with AASHTO T-202. The mixture shall be thoroughly mixed by recirculation, stirring air agitation, or other means.

(b) Addition of Rubber. The temperature of the asphalt cement- extender oil blend shall be increased to within the range of 350-425 degrees F. and an amount of ground rubber equal to 22 percent, plus or minus one percent by weight of the total asphalt-rubber blend shall be added. The rubber shall be added as rapidly as possible and the mixture shall be recirculated for a period of not less than 30 minutes after incorporation of all the rubber. Recirculation and stirring of the total combined material shall be maintained to provide good mixing and dispersion. Sufficient heat should be applied to keep the temperature of the total blend to between 350-425 degrees F. while mixing.

4. CONSTRUCTION METHODS

4.1 Weather Limitations. The asphalt-rubber surface coat shall be applied only when the existing surface is absolutely dry and the ambient air temperature is above 65 degrees F.

4.2 Equipment. All equipment, tools, and machines used in the performance of this work shall be maintained in satisfactory working order at all times.

(a) Distributor Truck. At least one pressure-type bituminous distributor truck in good condition will be required. The distributor shall be equipped with an internal heating device capable of even heating of the material up to 425 degrees F; have adequate pump capacity to maintain a high rate of circulation in the tank and have adequate pressure devices and suitable manifolds to provide constant positive cut-off to prevent dripping from the nozzles. The distribution bar on the distributor shall be fully circulating. Any distributor that produces a streaked or irregular distribution of the material shall be promptly repaired or removed from the project.

Distributor equipment shall include a tachometer, pressure gauges, volume measuring devices, and a thermometer for reading temperature of tank contents.

It shall be constructed so that uniform applications may be made at the specified rate per square yard within a tolerance of plus or minus 0.05 gal./sq. yd.

(b) Chip Spreader. A self-propelled chip spreader in good condition and of sufficient capacity to apply the aggregate within the time period specified will be required. The spreader shall be constructed so that it can be accurately gauged and set to uniformly distribute the required amount of aggregate at regulated speed.

(c) Brooms. Revolving brooms shall be constructed so as to sweep clean or redistribute aggregate without damage to the asphalt-rubber membrane or surface treatment.

(d) Pneumatic-Tired Roller. There shall be at least two multiple wheel self-propelled pneumatic-tired rollers with provisions for loading to eight to twelve tons as deemed necessary. Pneumatic-tired rollers shall carry a minimum of 4000 pounds on each wheel and shall have a minimum tire pressure of 100 pounds per square inch.

4.3 Cleaning Existing Surface. Prior to application of the tack coat and asphalt-rubber surface seal, the surface of the pavement shall be clean and free from any dust, dirt, or other loose foreign matter, grease, oil, or any type of objectionable surface film.

4.4. Application of Tack Coat. Following the preparation for sealing, asphalt cement shall be applied at the rate of 0.05 gallon per square yard. If emulsified asphalt is used it shall be applied at the rate of 0.07 gallon per square yard. If devulcanized asphalt-rubber is used no tack coat will be required.

4.5 Application of Asphalt-Rubber. The asphalt-rubber shall be applied by a pressure distributor within the temperature *range of 375-425 degrees F for devulcanized rubber and 290-340 degrees F for vulcanized rubber and at a rate of 0.55 + 0.05 gallon per square yard. The Engineer may vary the * application rate depending on the surface texture.

All transverse joints shall be made by placing building paper over the end of the previous application. The adjoining application shall begin on the building paper. The paper shall be removed immediately after use. Longitudinal joints shall be lapped approximately 4 inches.

4.6 Application of Aggregate. The application of aggregate shall follow as closely as possible behind the application of he hot asphalt-rubber, but in no instance should the distance *be greater than 100 feet unless otherwise directed by the * engineer.

Construction equipment shall not drive on the uncovered asphalt-rubber.

The dry aggregate shall be spread uniformly by a spreader at the rate of 30-50 pounds per square yard as directed by the Engineer.

4.7 Rolling. Rolling shall commence immediately following the application of the aggregate. Sufficient rollers shall be furnished to cover the width of the spread with one pass. The first pass must be made immediately behind the spreader. If the spreading is stopped for any reason, the spreader shall be moved ahead so that all cover material spread may be immediately rolled. The rolling shall continue until a minimum of four complete cover- ages have been made.

All loose aggregate shall be swept off the surface and removed.

5. METHOD OF MEASUREMENT

5.1 The asphalt-rubber mixture shall be measured by the number of tons or gallons of mixture used in the accepted work.

5.2 Aggregate shall be measured by the number of tons used in the accepted work.

6. BASIS OF PAYMENT

6.1 Payment shall be made at the contract unit price per ton or gallon for the asphalt-rubber mixture and at the contract unit price per ton for mineral aggregate. These prices shall be full compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Asphalt-Rubber Mixture--per ton (gallon)
Mineral Aggregate--per ton
Bituminous Tack Coat--per gallon